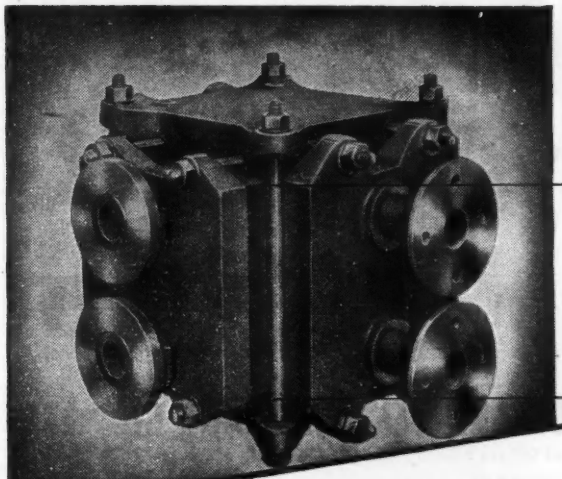
The Chemical Age

VOL LXV 14 JULY 1951 No 1670

INDEX TO ADVERTISERS IN THIS ISSUE



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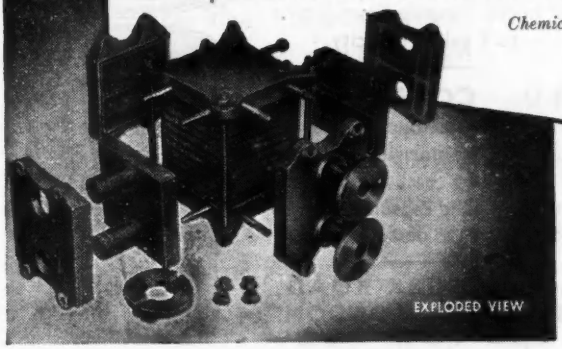

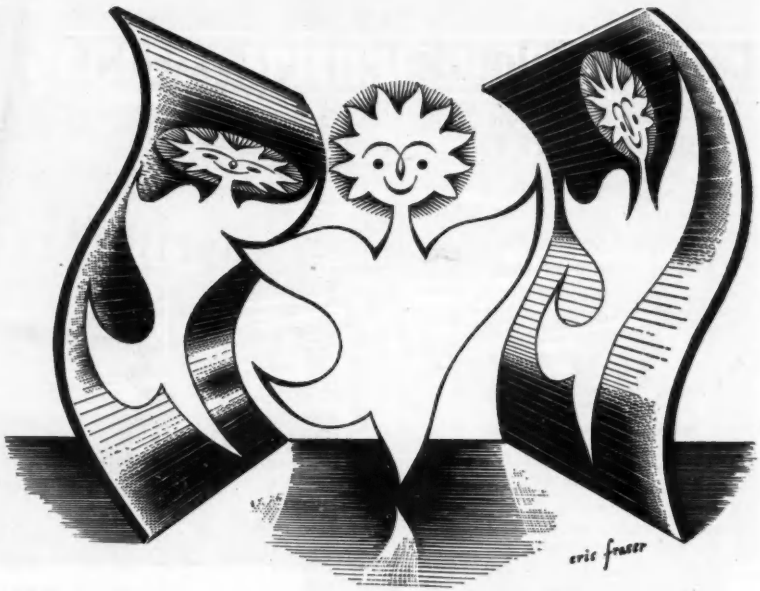

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The
Chemical Age

Established 1919

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Chemicals & Food

YET once more the use of chemical substances in food production or in food processing and preservation has been placed in the limelight of contention. A subject that should be discussed with scientific objectivity or not debated at all has been mauled by prejudices and polemics. It is regrettable that this should have taken place in the House of Lords, usually and traditionally a more responsible and less emotional debating chamber than the Commons. Even more regrettable was the immediate result of the debate—brief accounts of it in many newspapers with alarmist headlines that concentrated upon the more sensational anti-chemical statements that had been made. Readers of one highly popular newspaper were, for example, told that even mother's milk now contains DDT!

For political topics it may be reasonable to list all the cons of the case and ignore every pro, but when this method of discussion is applied to subjects essentially technical or factual an impossible atmosphere for clear thought and judgment is created. No one would deny that the use of some chemicals in food production or distribution has led to secondary troubles, but it is not constructive to list all such cases, no matter where they have occurred in the world and irrespective of their statistical significance, and to present this as a general case against the use of chemicals. Fertilisers have enabled the soils of the world to produce more food to be harvested; preservatives have enabled seasonally produced foodstuffs to be stored and evenly distributed; and certain chemicals have improved manufactured foodstuffs. Against all charges of failures or dubious secondary effects this large and positive side of the chemical record must be placed. Moreover, a general indictment based upon selected cases must be rejected. Each case of chemical intervention must be separately judged on its own *facts*. Unfortunately these principles of fair-minded discussion rarely operate when the 'naturalist' school of opinion goes chemical-hunting. On the contrary, the maximum effort is made to persuade the public that chemicals—often mineral substances as 'natural' as any other material used by the world—are poisoning them.

Some of the examples given in the House of Lords debate should not have passed without vigorous counter-attack. Two cases cited as evidence against chemicals were the use of DDT in dairy farming and the use of agene in flour production. It is well known that the heavy use of DDT in post-war America

—a development that regrettably outstripped the pace of advisory science—led to accumulations of DDT residues in milk and dairy products. When this was found to be taking place, the United States Food and Drug Administration virtually banned the use of DDT in dairy farming by allowing no tolerance for DDT presence in milk, butter, cream, or other dairy produce. Similarly, the use of agene in America, and recently its use in this country, have been stopped. The evidence of possible harm, as found in scientific tests upon animals, has been sufficient for official preventive action to be taken. The possible dangers arising from the use of these two chemicals in these specific circumstances were not brought to public attention by an alarmist campaign. They were found to exist by properly conducted scientific investigations and scientists at once suggested the necessary sanctions for safeguarding public health. Another example cited was the use of antibiotics to cure udder ailments of cows, which is known to have affected the cheese-making ability of their milk. This again has been recognised and it is clearly a secondary disability of the use of an antibiotic substance for mastitis; but is it better to have no easy cure for a disease that greatly reduces milk production? Is there any evidence that milk unsuitable for the bacterial processes of cheese manufacture is dangerous to human health? It was also suggested that the use of growth-regulating hormones to stop the sprouting of stored potatoes has led to a 1951 scarcity of good quality potatoes in London. After the abnormally wet harvest season of 1950, which was also a year in which less potatoes were cropped, some such scarcity is surely a natural effect. Furthermore, the use of such substances is in its infancy and the quantity so far employed in the potato trade can hardly have had significant consequences. The fact that some of the new organo-phosphorus insecticides require careful handling when they are sprayed was used as evidence that they must be dangerous when the final produce is consumed; the safeguarding fact that these materials rapidly lose their toxicity on being diluted with water—the property that enables them to be used as crop protectants—was ignored.

Every chemist will agree that the introduction of a new chemical into any part of the food producing or processing cycle must be carefully examined. If subsequently there is genuine evidence that some adverse and previously indeterminable effect is showing itself, there must be an urgent re-examination. Each case should be objectively considered on its own facts, its own merits and demerits. Any general indictment of chemicals or a general plan to prohibit the use of new chemicals can only put back the clock of progress.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes & Comments

A *Disappointing Affair*

THE British Instrument Industry Exhibition which opened at Olympia on 4 July was, on the whole, a rather disappointing affair. Every well-known instrument manufacturer had made a contribution and the exhibits ranged from the smallest meters to complete factory and plant installations. This profusion of exhibitors and exhibits was a welcome one, but its effect was largely vitiated by the lack of any attempt at an interesting or novel layout. The Festival exhibitions in the Dome of Discovery and the Science Museum have shown that it is possible to display scientific discoveries and apparatus in a new and exciting way and it was endeavour of this kind which was totally missing from Olympia. Critics may reply that the two are not comparable and that the eye of the buyer or visiting scientist does not require titillation, but this is bad psychology and it is the interested and not the dutiful but bored buyer who will stay to examine that extra exhibit which will produce new orders. The advertising sections of instrument companies should learn that it is not sufficient to hire a stand, fill it with a heap of their standard products and hide their representative in a corner. It was perhaps unfortunate that the present exhibition was preceded by that of the Physical Society at South Kensington. Much of the material on show was common to both exhibitions but the handbook of the British Instrument Industry Exhibition compared very unfavourably with that of its predecessor.

Apathetic Attitude

SOME of the most novel instruments were on display on the stand of the Department of Scientific and Industrial Research, among them being very sensitive devices for measuring mass and length by means of jets of air. Discussion showed again the apathetic attitude of British manufacturers to new methods and techniques, one scientist confessing that he received more inquiries from American sources than from British. This is a state of affairs that exhibitions are designed to cure, or, at least, alleviate. It is therefore the more important to intrigue and hold the awakened interest of representatives from industry. We have been told that the only solution to our present economic difficulties is higher productivity. Instrumentation is one of the methods of achieving that most desirable end.

Tribute to Joule

AN appropriate recognition of the work of James Prescott Joule (1818-1899), who laid the foundations of the science of thermodynamics, has now been made by the conversion of his house at Salford into a museum to display a collection of his apparatus, much of which had long been owned but inadequately displayed by the Manchester College of Technology. Joule was fortunate enough to be of independent means and devoted his life to scientific research. Although he modestly described his experiments as 'two or three little things, but nothing to make a fuss about', it was, in fact, his determination of the mechanical equivalent of heat and his accurate measurement of thermal effects which led the way to scientific engineering. He did not foresee where his work was leading and it was only by using his discoveries that others were later able to devise more effective electrical apparatus. The museum is a happy culmination in acknowledgment of the achievements of one of the greatest of the 19th century physicists who was activated by curiosity concerning the laws of nature and the perpetual search after truth.

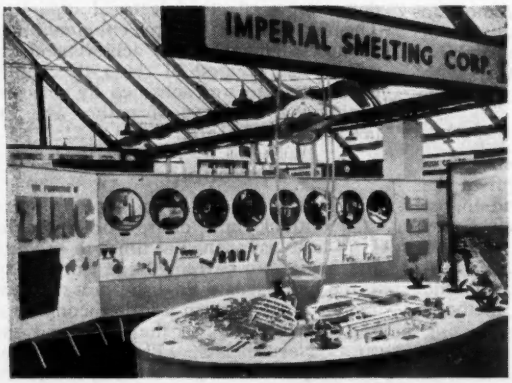
On the Threshold

AMERICA, with her more modern outlook and desire for abbreviations, is inclined at times to produce and bring into current usage words that, to the more sedate English point of view, tend at times to seem a little incongruous or to jar slightly on the mind and the ear. Nevertheless, Professor James Pickering Kendall, professor of chemistry

at Edinburgh University, most certainly made a good point at the 'capping' ceremony held on 5 July, when he said that he liked the name the Americans gave to that ceremony—commencement. For most of the graduates that day marked the end of their university studies, but it was, in fact, only the beginning of their career proper. The professor also had some wise and kindly words to those on the threshold of their scientific career. To those who had not been too brilliant, or, to put it bluntly, had just scraped through, he offered the consolation that they need not be unduly concerned, for 'university examiners are notoriously inexpert in spotting future winners.' Here, indeed, is one of the problems in trying to fill this country's shortage of technicians. All too often posts are advertised for personnel having high degrees and qualifications, but these do not necessarily prove, as experience has shown, to be the best at practical application. Professor Kendall finally urged the graduates that although he did not subscribe to the postulate that scientists were necessarily on a lower plane of culture than graduates in the older faculties, nevertheless close mutual contacts and a broad outlook were of primary importance. Scientists' services are at present, and likely to remain for some time, in demand, and those about to uphold the reputations of their various universities would do well to bear in mind the advice of Professor Kendall.

Allocation of Steel

WHETHER a comprehensive rationing of steel is justified or not is hard to say until more information is available regarding the probable additional requirements necessary for the defence programme in 1952. Nevertheless, steel production is falling, and it seems likely that output this year may well be only 16 million tons for the year, compared with production at a rate of 17 million tons a year in 1950. An allocation for iron and steel and corresponding measures for the more important of the scarce non-ferrous metals is being prepared, according to a written answer given by the Chancellor of the Exchequer in the House of Commons on 28 June. Such allocations must of necessity be of a complex nature requiring careful consideration and it will inevitably be some time—perhaps next spring—before they can be brought into operation. In the meantime a system of priorities has been introduced. The Defence Order symbol or label which is to be placed on approved orders should help the defence programme where completion of work is sometimes held up for lack of small quantities which do not fit easily into producers' programmes and are often not sought early enough. The 'PT' or preferential treatment scheme is expected to cover only some six or seven per cent of the steel supplies, and is intended to help in urgent civilian work.



The stand of the Imperial Smelting Corporation at the Bristol Industries Fair two weeks ago, showing the working model of their zinc production plant and various objects incorporating zinc in their manufacture

Instruments for Chemical Plant

Part IV—Properties of Solutions

AMONG the process factors which lend themselves particularly to measurement by newly developed or improved industrial instruments are solution conductivity, density, calorific value, viscosity, and consistency.

The design of improved electric bridge circuit mechanisms and of sturdy conductivity cells for plant service has introduced the measurement of electrolytic or solution conductivity into industry to a wide degree. The ability of a solution to carry electric current, or its specific conductance, can be used for determining certain desirable qualities. The commonly used method is to measure the resistance with A.C. of a column of the solution, and an instrument having a Wheatstone bridge A.C. circuit is generally used for practical purposes. Several conductivity meters and controllers have been recently developed, and two typical examples are described below.

The first instrument, used for manufacturing sulphuric acid, ammonia and other chemical products, is the Multelec Conductivity Recorder, as shown in Fig. 1. This instrument operates on the null point method and incorporates a sensitive galvanometer. An A.C. bridge or A.C. potentiometer circuit is used, together with a high frequency measuring cycle every two seconds, and a mechanical relay within the measuring mechanism transforms movement of the galvanometer needle into slidewire spindle rotation.

Normally a conductivity cell, consisting of

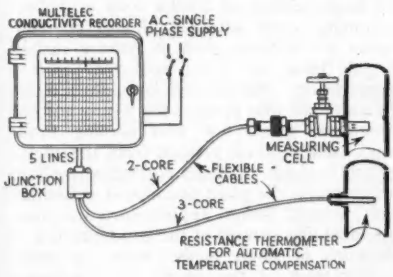


Fig. 1

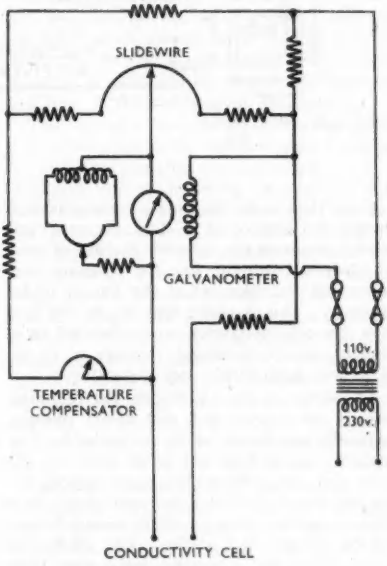


Fig. 2

two precious metal electrodes, is connected into a Wheatstone bridge circuit and fed with A.C. of 50 cycles frequency (Fig. 2). Unbalance of the bridge, caused by change of resistance between the electrodes, is measured by the galvanometer. Various types of industrial conductivity cells as primary element have been developed for liquids under pressure and under various atmospheric conditions, as well as for corrosive solutions. Pressure type cells can be installed directly and permanently into a pipeline or vessel (*e.g.*, condensate or feed pump suction line).

Correction for temperature can be made either manually by a rheostat in the instrument, or automatically by a resistance thermometer installed next to the cell (the circuit is modified to incorporate the thermometer). When temperature variations are small, manual compensation may be used, but if the temperature varies to any great

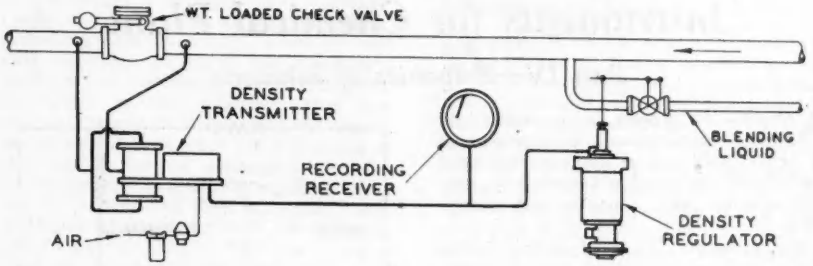


Fig. 3

degree, then fully automatic compensation should be employed. The pressure cell shown possesses the valuable feature of easy withdrawal from the line for cleaning purposes and suchlike, while the line is under pressure. This is made possible by the fact that the cell electrodes are embodied in a plunger which is passed through a 1½ in. valve with appropriate steam packing.

To withdraw the electrodes, the retaining ring is unscrewed and the whole plunger assembly withdrawn as far as possible. The amount of withdrawal is limited by the cover tube shoulder which bears against the internal shoulder of the extension piece, thus preventing the plunger from being blown out by the pressure in the main. With the valve closed the extension piece may then be unscrewed from the valve body, and by unscrewing the cover tube the electrodes may be inspected.

Another conductivity controller, recently introduced by the Equipment Division of Mullard, Limited, is one which provides a convenient and sensitive method for controlling chemical or concentration changes in a wide variety of industrial processes, including the automatic control of boiler water condensate. It operates on the same principle as the Mullard conductance bridge already being widely used for routine laboratory and factory conductivity determination, and employs a modified Wheatstone bridge network operating at a test frequency of 2.9 kc/s., using an amplifier and relay circuit incorporated in the instrument. A visual or aural warning may be given if the ionic concentration of the solution under control either rises or falls from a predetermined value. The conductance of the solution may be kept within specified limits by using the controller relay to add solute to the liquid as required. In addition, the actual conductance at any time can be quite simply observed by means of a magic eye balance indicator and direct-reading bridge dial located on the front panel of the instrument. The bridge test voltage is supplied by an internal oscillator and at the frequency employed polarisation effects are minimised.

The instrument dial is calibrated in micromhos and the readings must be multiplied by the cell constant to obtain the actual measurement of conductivity. An inner scale is also provided which reads from 1 to 100 parts per million of sodium chloride. When working on this range, it is necessary to use a specially jacketed conductivity cell, which then makes temperature compensation automatic.

The electrodes used for insertion into the liquid under test consist of two pieces of platinum foil fused into a rigid glass body. Flexible leads are brought out for connection to the controller. Three types of cell are available, including the industrial cell intended for permanent installation, threaded ¾-in. From the many practical applications the measurement of caustic soda or potash scrubbing tower solutions should be mentioned, these being used to remove carbon dioxide from air or by hydrogen prior to compression. Another use provides a direct measurement that protects the piping and the circulation system of acid cooling tower condensate removal systems from the effects of acid leakage. A high conductivity alarm switch warns the plant operator if something goes wrong. Other applications are measurement and control of the concentration of solutions of single acids, bases or salts; measurement of the purity of condensed steam, distilled water, demineralised or

de-ionised water. Acidic gases as H_2S, CO_2, and Cl_2 can be determined in low concentrations by the change of conductance of a certain volume of an absorbant solution, such as $Ba(OH)_2$ in the case of CO_2, after the passage of a known volume of contaminated air.

Industrial instruments for measuring the density of liquids and gases have been used for many years in various branches of industry. One of the best known principles used is the different air pressure in two dip tubes necessary to equalise two liquid columns of equal height. One liquid column is water, as a basis for comparison. A water jacket ensures equal temperature, and the recording or recording and indicating instrument shows the specific weight relative to water. A modern type of liquid density transmitter for remote measurement and control is shown diagrammatically in Fig. 3. It uses a buoyant displacer in the transmitter housing and compressed air for pneumatic telemetering to the density regulator, which actuates a control valve for the admission of blending liquid.

Fig. 4 shows the cross-section of the transmitter with displacer, reaction diaphragm, and air nozzle. A sample of liquid is introduced into the centre of the body and flows through an annular space formed by a diffuser ring, and out through the top and bottom discharge lines. The proportions of the annulus have been carefully worked out to minimise the sampling lag without introducing errors due to velocity. The liquid buoys up the displacer, which is mounted rigidly on the weigh-beam. The latter pivots on ball-bearings and is so counterbalanced that liquid of the minimum density will just start to lift the displacer. Rise of the latter alters output pressure from the air nozzle to the diaphragm control valve. Displacer size, diameter or reaction diaphragm and lever linkage determine the range.

The use of a headmeter (differential mercury manometer) for density measurement is illustrated in Fig. 5. Specific gravity is measured and recorded by applying the differential pressure which develops between the two bubble pipes, to a mercury-filled U-tube manometer. The manometer used has a 10 inches-of-water differential pressure range and is counterpoised. This means that the range tube slide is set at a predetermined level below the float chamber so that, under operating conditions, the difference in mercury level in the two chambers will be equal to the minimum gravity range of the meter. Generally, this is 1.00, the specific gravity of water. However, it can be of any value, 1.100 of 1.250 for example, below which the measurement of specific gravity is not desired. As a matter of interest, a Swedish instrument firm uses a cyclone indicator for continuously controlling the density of paper pulp during manufacture. The control impulse is derived from a measuring cyclone

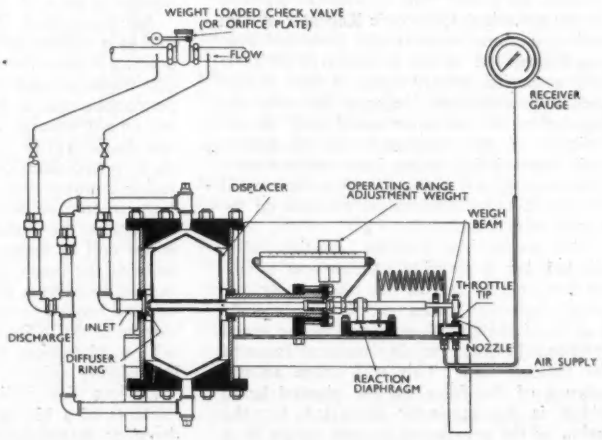


Fig. 4

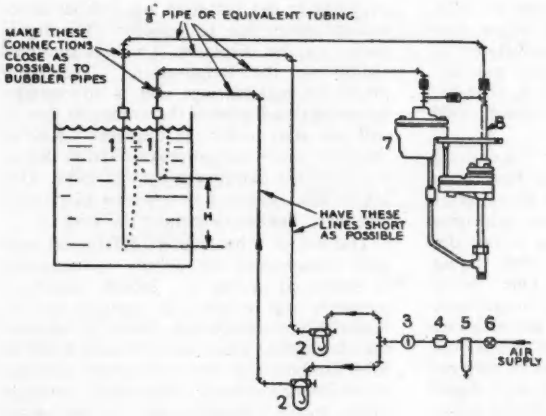


Fig. 5

into which a continuous sample of the pulp flows. This is brought to rotation by spiral flow, and the height of pulp varies with its density. The density regulator is oil-hydraulically operated, and a power cylinder actuates the control valve for administering water to the pulp.

A recently developed electronic instrument is shown in Fig. 6, which is designed to measure the specific gravity of flowing liquid in a process. Measurements are made in an enclosed chamber, and the contents are continuously renewed from the main stream at the rate of approximately six changes per hour. The transmitter operates on the Evershed Electronic Repeater system and in conjunction with the Evershed Process Controller. It has a sensitivity of .0005 over a specific gravity range of .025. There are no mechanical linkages between the interior of the pressure vessel and the remainder of the equipment, all movements and forces being transmitted magnetically. The transmitter is automatically compensated for the effect of temperature changes on the liquid being measured.

The measuring element consists of a pivoted beam carrying at one end a permanent magnet and at the other a flexible metal bellows. Changes in the specific gravity of the liquid surrounding the metal bellows will vary the displacement force of the bellows unit. This will cause an unbalance of the force on the pivoted beam which is automatically corrected by the action of the permanent magnet on the field of the electro-magnet surrounding it. The correcting force provided by the coil and magnet assembly is therefore a measure of the change in specific gravity and may be indicated on a milliammeter in the coil circuit, as the force and the current in the coil are directly proportional. Compensation is provided for the displacement force created by the temperature change, and the reading of the specific gravity indicator is therefore referred to the measured liquid at a given temperature. In practice the liquid in the bellows is a sample of the liquid under test, and a filling plug is provided to enable other liquids to be used.

Any movement of the permanent magnet due to a change of force on the beam will produce a movement of the pivoted shutter outside the pressure chamber, due to a small permanent magnet following the larger magnet on the measuring beam. Movement of this shutter varies the amount of light falling on a photo-electric cell, the emission of which controls the grid-cathode voltage of a thermionic valve, whose anode circuit incorporates the distant indicator and transmitter coil in series. Any attempted movement of the beam, therefore, causes the coil current to exert a restoring force and maintain the beam in a condition of balance. The current in the indicator circuit varies between 0-30 milliamperes D.C. and the circuit is intrinsically safe.

Devices for indicating the level of the contents of a bin or bunker in which powdered or granulous substance is stored have

come into wider use in chemical works. The position of material at which a signal is required may be either a high or a low level. The usual way is to have alarm lights fitted on a signal panel, the light in the lamp being extinguished in case of alarm, which is better than being illuminated in case of current failure. Bin level indicators can work either on mechanical principles, namely, being actuated from pressure of the material, or, by a photo-cell and light beam, or, again, by the electrical conductance of the material.

A type of instrument which has been developed by various instrument makers to meet the need for a sequence recorder of events such as idle times, etc., is the Event Recorder, also called the Operation Recorder. The usual design for this provides for a strip chart with several pens, these being put into operation by related solenoid valves, if the latter are energised by an impulse current. It is possible to equip machines or apparatus, or single machine parts with suitable micro-switches, making contact when desired. Alternatively, any electric current used in operation can be duly recorded. It is to be noted that incentive schemes can be based on records thus obtained. Similar operation recorders have recently been used in research work.

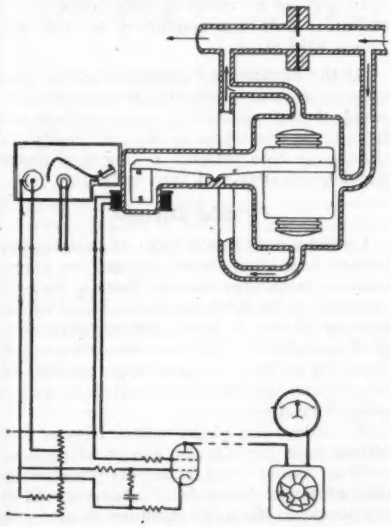


Fig. 6

A ten-pen operation recorder which can be used for investigating chemical processes under actual working conditions over prolonged periods is made by Evershed & Vignoles, Ltd. The instrument can be conveniently built into a central instrument panel together with various recording instruments for process factors, thus completing the picture of what is going on in the plant.

Refrigeration Congress

TECHNICIANS and industrialists from many parts of the world are expected to attend the eighth International Congress of Refrigeration which is to be held in London, at Church House, Westminster, from 29 August to 11 September.

Governments of some 50 countries are members of the International Institute of Refrigeration (L'Institut International du Froid) under the auspices of which the congress will be held. The organiser of this year's event is the Institute of Refrigeration, which was founded in 1900 and is the oldest society of mechanical refrigeration in the world.

The various subjects dealt with in the papers and discussions will be grouped under seven commissions. Commission V deals with 'Applications of refrigeration to entrepots for preserving perishable foods, ice factories and chemical industries.'

Among the papers to be presented on the industrial phases of the subject will be: 'A New Method for Controlling Refrigerating Machines with Capillary Tube Regulation,' O. Linna (Germany); 'The Influence of Speed on the Volumetric Efficiency of Reciprocating Refrigerant Compressors,' Dr. G. Lorentzen (Norway); 'Recent Advances in Refrigeration and Handling Equipment of Large Commercial Cold Stores and Locker Storage Plants in America,' Professor R. Woolrich (U.S.A.); and 'A Solid Absorption Machine for Refrigerated Railway Vehicles,' H. I. Andrews (Great Britain).

Food questions are naturally important and will be dealt with under 'Fundamental Biochemical and Biophysical Studies,' (Commission III).

An interesting programme of excursions and industrial visits for delegates to the congress has also been arranged.

Manufacture of Sulphuric Acid from its Natural Salts

By S. P. SCHOTZ, D.Sc. (*Zurich*), B.Sc. (*London*), A.R.T.C. (*Glasgow*); F.R.I.C., F.C.S.

AMIDST the general outcry for sulphur and the lament that Britain is short of sulphuric acid, the great majority of our people are quite unaware that the British Isles are practically floating in a solution of salts of sulphuric acid. Every hundred gallons of sea water contain 2½ lb. of sulphuric acid in the form of various salts. If only a cheap way of isolating it could be found!

Before making such an attempt, however, considerable efforts are being made to utilise to the full our deposits of gypsum and anhydrite and other salts of sulphuric acid. These will last a very long time, and on account of their abundance and cheapness, would probably have completely replaced sulphur and pyrites in the manufacture of sulphuric acid during the present shortage, but for three reasons.

Three Reasons

First, coal is necessary both inside and outside the retorts, while sulphur and pyrites burn with little or no assistance.

Secondly, the plant for the production of sulphur dioxide from gypsum and anhydrite is much more expensive, requires considerable attention and is more costly to maintain in good condition.

Thirdly, it is necessary to find good use for the burnt lime obtained as a by-product.

This problem was solved by the Germans by mixing anhydrite not only with coal to form sulphur dioxide but also with sufficient clay to obtain a residue which after grinding should form cement. It has also been found advantageous to add small quantities of iron oxide in the form of burnt pyrites in order to facilitate formation of a flux.

If such iron oxide is not available, a clay containing sufficient oxide of iron could be found, or a mixed coal and iron ore, many of which are found in Britain, might be employed, as coal containing not more than 50 per cent of carbon is quite satisfactory in this process.

Reaction is carried out in rotating retorts, so that cement works plant could be adapted for this purpose. Almost any kind of material containing sulphur, such as spent oxide and pyrites, could be worked in the same factory. As the plant for making sulphuric acid by the contact process is comparatively small and simple, this process would form a valuable side-line.

Manufacture proceeds in the following stages:—The ground raw materials are mixed in the correct proportion established by chemical analysis and introduced at a definite rate into the retorts. These are slowly rotating cylinders, 70 metres long and 3 metres in diameter, the top of which are lined with firebricks and the lower parts which are in the firing zone, with magnesite bricks. They are inclined at a small angle to the horizontal and powdered coal is used for firing.

The sulphur dioxide together with varying quantities of carbonic acid and air is drawn by means of blowers through electrostatic dust precipitators of the Cottrell type, washed with water, cooled, and passed through *wet* electrostatic precipitators. It is then dried by spraying with concentrated sulphuric acid and conducted to the sulphuric acid plant.

As the conversion of sulphur dioxide into sulphur trioxide takes place in the neighbourhood of 400° to 600°C., some method will have to be discovered to dry and purify the sulphur dioxide without cooling it to ordinary temperatures and then re-heating it.

Plentiful Deposits

Gypsum, a hydrated form of calcium sulphate, and anhydrite abound in large deposits in various parts of Britain. As only gypsum of the whitest colour is picked for making plaster of paris and our exports in 1947 equalled 1¼ million tons, this would leave for sulphuric acid a huge quantity of discoloured gypsum and anhydrite previously unusable.

A combination of the manufacture of sulphuric acid, cement and plaster of paris as outlined would result in a great price reduction of these essentials of chemical industry, engineering and building trade and greater independence from foreign imports and competition.

The Determination of Fluorine

Organic Fluorine Compounds

THE increasing importance of organic fluorine compounds makes simple and reliable methods for the determination of fluorine in such compounds extremely desirable. Reliable methods for the determination of chlorine, bromine and iodine in organic compounds have been available for many years. However, fluorine differs considerably from the other halogens in its chemical behaviour, and the conventional halogen methods cannot be applied for its determination. The fluorine-to-carbon bond is much more stable than the other halogen-to-carbon bonds and this renders the decomposition of organic fluorine compounds somewhat more difficult.

There are two distinct problems involved in the determination of fluorine in organic compounds: (1) the quantitative decomposition of the sample and (2) the method used for the final determination. It is not always possible to achieve a rapid and efficient decomposition because of the great stability of certain fluorine-containing compounds, and the final determination is complicated by the fact that there is no really satisfactory method for the determination of the fluoride ion.

A Complete Classification

A complete classification of methods used for the decomposition of fluorine-containing compounds has been given by Elving and Ligett[1] but it is not proposed to detail these here. Some of the decomposition methods have only been applied to the determination of other elements in the particular compound being analysed and not to fluorine itself. In modern practice only three methods appear to find general favour: (1) decomposition by alkaline hydrolysis, (2) decomposition by fusion with sodium or potassium in a sealed tube or a nickel bomb, (3) decomposition by combustion in a bomb with sodium peroxide.

Method (1) is obviously only applicable to compounds which are readily hydrolysed and is, therefore, limited in use. More resistant compounds must be decomposed by method (2) or method (3).

Morgan and Tunstall[2] determined the fluorine content of the easily hydrolysable boron β-diketone difluorides by precipitation as sparingly soluble calcium fluoride. The weighed substance is boiled with 30 per cent potassium hydroxide solution until hydrolysis is complete and the fluoride precipitated by addition of calcium nitrate. After digestion on a water-bath, the precipitate is filtered, washed with 0.1 per cent acetic acid, dried and ignited. Chapman, Heap and Saunders[3], who were concerned with fluorophosphonate compounds—compounds containing the P-F linkage—hydrolysed these compounds with a large excess of sodium in alcohol to give a theoretical yield of fluoride ion. The determination was completed by precipitation as lead chlorofluoride and titration of the precipitate by the well-known Volhard method.

A Fusion Method

Elving and Ligett[1] presented a fusion method for the decomposition and analysis of organic fluoro compounds. The procedure depends upon decomposition of the compound by heating with sodium or potassium in an evacuated sealed tube at moderately elevated temperatures, and gravimetric determination of the resulting alkali fluoride as lead chlorofluoride. The method has the advantages of simplicity, rapidity and accuracy when applied to a wide variety of compounds.

Decomposition in a nickel bomb with metallic potassium at 500°C. is preferred by Kimball and Tufts.[4] The resulting alkali fluoride is dissolved in water, silver perchlorate and perchloric acid added, and the fluoride distilled and titrated with standard thorium nitrate solution.

Nichols and Olsen[5] decomposed many aliphatic and aromatic organic fluoro compounds by fusion in a nickel Parr-type microbomb with sodium peroxide. The fluoride formed was then titrated electrometrically with a glass electrode using 0.01 N cerous nitrate solution. These workers obtained an absolute accuracy of ± 1 per cent and listed the results of a study of the effects of initial *p*H, initial volume, temperature and the presence of several neutral salts during the titration. A visual end-point method employing methyl red as indicator also proved satisfactory in this

titration, though the electrometric method is preferred where results of the highest possible accuracy are required. In the presence of certain salts the methyl red end-point is indistinct. Sulphates interfere hence the method cannot be used on sulphur-containing compounds.

Other methods have been recommended for completing the determination[6,7,8] but the lead chlorofluoride and the thorium nitrate methods appear to be the best of those available at the present time.

Lead Chlorofluoride Method

The lead chlorofluoride method is subject to many errors and various means have been devised to overcome them, of particular importance being the *p*H at which precipitation is effected. It appears, however, that at least 20 mg. of fluorine must be present for satisfactory results to be obtained, hence the method cannot be used on the micro scale. Cropper[9] has successfully titrated fluoride ion with lead nitrate. This procedure is a reversal of the well-known Farkas and Uri determination of lead with fluoride. The fluoride solution is buffered, and excess sodium chloride added. Titration is then effected potentiometrically with lead nitrate. The procedure is briefly as follows: 1 g. of sodium chloride and 20 ml. of N. *p*H 4 buffer are added to the fluoride solution (containing 40-120 mg. of fluoride). Titration is then carried out potentiometrically—a Tinsley potentiometric apparatus is used with a Pt-saturated HgCl electrode system—with a standard solution of lead nitrate.

Towards the end of the titration a mixture of 20 mg. of ferrous chloride and 0.4 mg. of ferric chloride is added as indicator. At the end point, the complex FeF_6^{-3} ion dissociates to give free fluoride ion with a consequent alteration in the Redox potential of the system. Lead chloride is not precipitated during the titration. The author states that the lead chlorofluoride procedure is the best of the available methods, but suffers from the disadvantage that, during the filtration of the precipitate and its subsequent washing with saturated lead chloride solution, chloride ions may be strongly adsorbed on the precipitate leading to high results. As has been mentioned, the lead chlorofluoride method cannot be used to determine micro amounts of fluorine. In this case the thorium nitrate titration procedure is employed. After decomposition of the organic fluoro compound, the fluoride is titrated with a standard solution of thorium nitrate. Insoluble thorium fluoride is precipitated and at the end-point the first drop of thorium in excess will give a colour with one of several indicators. It appears that none of the indicators hitherto recommended for this titration is entirely satisfactory, although it is generally agreed that Alizarin S and Solochrome Blue BS both function satisfactorily when very small amounts of fluoride are being titrated. Difficulties arise in the titration when amounts of fluoride ranging from 0.5 to 5 mg. are titrated, the precipitate of thorium fluoride adsorbing the indicator and changing colour before the equivalence point is reached. Some workers have claimed that the addition of starch eliminates this trouble, but other workers find that the starch is without effect. If aliquots of such a concentration are taken that precipitation does not occur and a true end-point is obtained, the volume of titrant necessary to effect a detectable colour change is so large that the accuracy of the determination is seriously impaired.

It has been claimed that if the thorium fluoride precipitate is filtered off when the false end-point occurs, the filtrate can be satisfactorily titrated to the true end-point. This is a cumbersome and time-consuming procedure, but it yields more accurate results than other methods tried. A further improvement in the titration is the use of a screened Alizarin S indicator which furnishes a more easily detectable end-point in artificial light. In daylight, however, there is no difference between the screened and the unscreened indicators.

Breakaway Necessary

There is also some doubt as to the stoichiometry of the reaction, and it would seem, taking everything into account, that any improvement in the determination of the fluoride ion must be a complete breakaway from the thorium nitrate procedure.

The new organic fluorine chemistry has also presented analytical chemists with the problem of determining the elements (C, H, O, N, S, etc.) in such compounds. At the present time, the determination of carbon and hydrogen in fluorine-containing compounds has been accomplished by several workers. Perhaps the most satisfactory

[*continued on page 50*

D.N.O.C. More Than a Weedkiller

Eight Fatal Cases in Four Years

THE appearance in the *British Medical Journal* of two articles on the poisoning of agricultural workers by the selective organic weedkiller dinitro-*ortho*-cresol (D.N.O.C.) will be of interest to all who have had occasion to use this and other toxic weedkillers and insecticides. The article was prompted by the death over a period of four years, from 1946 to 1949, of eight agricultural workers in Britain (as well as others abroad), and one of the articles is a report of the effects of D.N.O.C. on five human volunteers in a series of controlled tests.

The means of distribution of D.N.O.C. is usually by spraying machines drawn by tractor. It is a yellow, crystalline solid dissolved in water to the extent of 5 to 8 lb. per hundred gallons of water, which is sufficient to spray approximately an acre of land. It is also a constituent of the oily wash used for late winter fruit tree spraying, but no fatalities or cases of poisoning have been reported among these operators, the concentration of D.N.O.C. being much lower than in cereal crop spraying.

Types of Spray

Two men work the crop spraying tractor, and they are both exposed to risk. There are two types of spray in use, both comprising a tank connected to a long spray boom containing nozzles, which is towed behind the tractor. In the less dangerous version the spray from the tank is forced through the nozzles by a simple reciprocating pump working at 27 lb. per sq. in. which results in a spray of comparatively coarse droplets from which there is little danger of drift. There is an agitator in the spray tank to keep the solid in suspension. In the second, more dangerous type, the liquid is forced through the nozzles by an air blast from a centrifugal fan, which breaks up the liquid into a fine spray which drifts readily and dries on the machine as a fine yellow dust. Moreover there is no agitator in the spray tank and so the nozzles tend to become more frequently blocked, resulting in more frequent attention from the operators.

Naturally the most important factor in preventing poisoning is a recognition of the symptoms. These, unfortunately, are often mistaken for the normal aftermath of a hard day's work in the fields. They are fatigue, excessive sweating, unusual thirst, and loss of weight, and they were present for as long as 48 hours before death in all the fatal cases reported. Acute anxiety and restlessness generally follows, and the interval between the onset of these symptoms and the time when the patient becomes acutely ill, with an increased rate and depth of respiration and rise of temperature, may be less than one hour. Death in coma follows rapidly. Yellow staining of the palms of the hands, soles of the feet, hair and scalp also occurs in serious cases.

Nearly all the fatal cases reported felt well enough to work on the actual day of their death, and in all eight cases the weather was unusually hot. The action of D.N.O.C. is to speed up cellular metabolism, and this is greatly accentuated by the heat. This action is very similar to that of the related compound, dinitrophenol (D.N.P.), and during the manufacture of this compound as an explosive during World War I many cases of poisoning and some deaths were reported, as also they were when D.N.P. and D.N.O.C. were introduced in 1933 for the treatment of obesity. They were rapidly dropped after this. Bilateral cateract is also caused after strong ingestion of either substance, and although no agricultural workers have reported it, this hazard exists.

Treatment

Treatment of the poisoning, once the symptoms have been recognised, is aimed at decreasing the metabolic rate by sedatives such as the barbiturates, introduced intramuscularly when the anxiety and restlessness are very pronounced. The administration of oxygen, cold sponging and the provision of water assist in relieving symptoms due to oxygen lack and excessive sweating. It has also been claimed that intravenous injection of 10 ml. of a 2.5 per cent solution of methyl thiouracil reduces the metabolic rate rapidly in poisoned persons. D.N.O.C. can be absorbed by mouth, by inhalation, and through the skin, and as it is a cumulative poison—the body excretes it very slowly—persons who have suffered any symptoms of

poisoning should be removed from risk of further absorption for at least six weeks.

Recommended preventive action, obviously more desirable than cure, is given by the report of the Zuckerman Working Party on the handling of toxic substances in agriculture (*see British Medical Journal*, 1951). This includes instructions regarding protective clothing, washing facilities, working periods, supervision of workers, arrangements for meals, and methods of decontaminating machinery and equipment. If these precautions are strictly observed, the risk of poisoning is greatly reduced, although careless handling or accidents at work may result in the absorption of dangerous amounts.

In the eight fatal cases reported, protective clothing was supplied, and some of the men had been instructed in safe handling, but the heat of the day was so great that the clothing was discarded. Regular inspection and careful questioning of men using D.N.O.C. before they start work each day is the only way of detecting the early symptoms of fatigue, insomnia, sweating, thirst, and loss of weight that indicate poisoning. Yellow discolouration signifies the absorption of significant quantities and may precede symptoms. All these signs should be regarded as manifestations of D.N.O.C. poisoning whatever other factors may appear to play a part in causing these symptoms.

The conclusions drawn from the five volunteers who received doses of D.N.O.C. support the above details; 75 mg. of D.N.O.C. given by mouth resulted in the blood concentration reaching 15-20 μg. per g. of blood with 3-5 days, and as long as 40 days later, 1-1.5 μg. per g. of blood were still present. Additional doses caused temporary higher concentrations associated with symptoms, which appeared when blood concentration reached about 20 μg. per g. of blood, or after 350-500 mg. of D.N.O.C. had been given. Exercise increases the level in the blood (that is why absolute rest is essential), but large amounts of liquid cause no apparent changes. The amount of D.N.O.C. excreted unchanged in the urine is only about 1-2 per cent of that taken.

Cutting Down Waste

FOR several years the Nobel Division of Imperial Chemical Industries, Ltd., has sought the co-operation of all employees in waste prevention. Campaigns have been run which focused attention on the principal sources of wastage in raw materials, power and time, which, if eliminated, could make a significant contribution to general efficiency. Several methods of pointing the message have been adopted. Lectures have been given to foremen and supervisory staff but the means of enlisting the aid of process men and tradesmen in the factories was with anti-waste quiz competitions, for which substantial prizes were offered.

Quite recently the competition for 1951 ended and prize winners have been announced. The manner of drawing up the questionnaire and the form of answer were carefully designed to give competitors, who seriously tackled their entries, a basis of knowledge which they might apply in practice. The questions dealt with varied aspects of waste and first of all entrants were asked to group related points together and then to place them in order of importance.

Determination of Fluorine

continued from page 48

method is that of Belcher and Goulden[10]. The sample (3-5 mg.) is burned in a silica combustion tube, using a 4 ml. per minute oxygen stream. Oxidation of the combustion products is completed by passage over a platinum contact heated to 750°C. Silver wool, heated to the same temperature removes sulphur and halogens including the fluorine from any hydrogen fluoride produced during the combustion. Granular sodium fluoride, heated to about 270°C., serves to absorb silicon tetrafluoride. The water vapour and carbon dioxide are determined in the usual way by absorption in magnesium perchlorate and soda asbestos respectively. Nitrogen oxides are removed externally with manganese dioxide.

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Productivity Team Report

Valve Manufacturers Analyse U.S. Methods

AT a Press Conference given at the Waldorf Hotel on 6 July, the leader of the Anglo-U.S. Valve Productivity Team, Mr. K. M. Leach, said that the task of the team was only half completed. Having written their report, he said, their next job was to prod industry into accepting some of their findings and acting on them.

Although, said Mr. Leach, this report only referred to the valve industry, he thought that the rest of the engineering industry could gain from many points in it. Briefly, he summarised the main points of difference between U.S. methods and our own which accounted for higher U.S. productivity. (1) American handling of all goods, from the raw materials to the manufactured articles, was better. (2) There was better tooling and planning, and more special-purpose or specially adapted machines were used over there. (3) Nothing new or unknown was seen there, but U.S. application seemed better.

Expanding a little, Mr. Leach said that our planning engineers had got a big field ahead of them extending methods of production in this country, but that there were not enough planning engineers to do it. Greater simplification and standardisation of product in the U.S. and a greater use of welding techniques also helped to increase U.S. productivity. It was not, he thought, that the average American worked harder than the British worker, but that he had slightly better equipment and facilities. Also there was a minimum of lost time and a readiness to take advantage of labour-saving devices, including operating more than one machine at a time. A summary of the report itself follows.

Productivity can be Increased

The team is convinced that, despite the achievements of the British valve industry in nearly trebling the volume of its production in the last five years, much can still be done to increase productivity in factories. It emphasises that, at a time when rearmament makes it imperative that efficiency should be raised to a maximum, only increased productivity can heighten or even maintain the standard of living of all in this country.

The team considers that the average productivity in the U.S. valve industry is higher than the average in the U.K. The range of valves manufactured is so wide that the team was unable to gather enough information to say by how much.

The team was impressed by the close personal contact that exists between senior management and employees in the U.S.A. The president of one U.S. company, employing 450, toured his whole factory three times a day and made a point of speaking to a number of different operatives on each visit. Comparatively large staffs are employed to take the pressure of detail off management, leaving it free to concentrate on the overall picture. The importance of supervisors being free from anything but supervising is fully recognised in the U.S.A. Foremen are not required to be part-time clerks. As a rule they are relieved of paper work in connection with planning and production records, machine loading and routing of material; where they do undertake responsibility for machine loading and work of a similar nature they are provided with adequate clerical assistance.

No Barriers

The team noted that in the U.S. the wide range of wage-rates over occupations and over each occupation itself, coupled with complete absence of any barrier to prevent a man moving from one wage group to the next, or from one occupation to another more highly paid, does much to stimulate a desire for self-improvement. A man of say, age 40, and unskilled, can enter a factory and work up to be a skilled man without first serving an apprenticeship.

Extensive use is made in the U.S. of job evaluation, which is the process of determining the degree of skill, effort and responsibility it demands and assessing the working conditions in relation to other jobs in the same factory. The team considers that job evaluation could with advantage be introduced more widely in this country.

Every endeavour is made to reduce manufacturing or running costs to a minimum, although at the same time there is a willingness to spend large sums of money on capital

equipment, arising from the fact that this is a 'once only' charge and from the belief that it will ultimately reduce manufacturing costs.

The abundance of professional engineers, technicians, draughtsmen and the like was most striking. Much of the higher productivity in the U.S.A. valve industry was due to the work of the engineering (planning) departments, especially in designing appropriate jigs and fixtures and in selecting the right machines, tools, feeds and speeds for the various jobs.

The team considers that the technical education of both staff and potential staff in the U.K. must be fostered to the greatest possible extent. An urgent requirement exists for additional full-time university or college courses. Until this can be met it is more important than ever for all valve manufacturers to ensure that their student apprentice schemes are as satisfactory a substitute as possible for full-time college training and that the apprentices are encouraged to make full use of part-time training courses at technical colleges.

Many Old-Fashioned Buildings

In the U.S.A. the team found a tendency to move entire factories out to new sites in the country, many employees being able to remain in their former homes because of the ease of transport. The team considers that in the U.K. many factories suffer from old-fashioned, inconvenient and, in some instances, widely-separated buildings, and that rebuilding of these would definitely aid production. Heating arrangements in the U.S.A. were universally good and the team considers that an influence detrimental to high productivity in the winter in U.K. factories may be insufficiently heated workshops. The provision of a temperature of at least 55°F. at starting time in the morning is a first essential. The team also recommends attention to lighting in U.K. machine shops.

The need for efficient handling of materials and components was one of the most important lessons brought to light by the team's visit, and one to which all U.K. valve manufacturers could usefully give careful study. The team considers that most U.S. factories handle materials better than the best U.K. factory they had visited. They were impressed by the use made of such handling equipment as pallets, stillages, fork-lifting trucks, power lifting tackle and gravity roller conveyors. The underlying principle in U.S. factories is never to put anything on the floor, because someone has to be paid to pick it up and thereby the cost will be increased but not the quality. This principle, naturally, could not be applied absolutely, but it was surprising how near some companies had got to it.

More automatic and special-purpose machines are used in the U.S.A. than in the U.K. The team recommends that the U.K. industry should introduce more machines of this nature, wherever production quantities justify them. Although some might be expensive, others need not have a high first cost. For many jobs standard machines could be modified in order to serve as special-purpose machines. Apart from this difference, the machines in common use in the valve industry in the U.S.A. are quite similar to our own, but a great many are used more effectively.

Efficiency could be increased by the more extensive employment of jigs and fixtures, even where small batches are involved; by the widespread introduction of air and electric chucks; by better tooling; and by selection of the best tool for the job and the application of studies of tool-grinding techniques and of optimum feeds and speeds.

British Standards Urged

The team believes that energetic steps should be taken to persuade users and manufacturers to work fully to British Standard Specifications and that these Standards should be kept as simple as possible. The subjects of specialisation, standardisation and simplification provide a fertile field for increasing the sizes of manufacturing batches and keeping overall equipment costs down. In the U.S.A., batch sizes for similar components range from the same order of magnitude as here to ten times as large.

Remember that a company which cannot make profits will become a liability to owners and employees.

If a man is fit to do a job, whether he was apprenticed or not, let him take his opportunity. The country has good use for all men of ability who can be found.

Copies of the Report, price 3s. 6d. (post free), may be obtained from the British Valve Manufacturers' Association, 32 Victoria Street, London, S.W.1, and the Anglo-American Council on Productivity, 21 Tothill Street, London, S.W.1.

Chilean Nitrate Prices

REVISED prices for industrial and agricultural Chilean nitrate of soda and Chilean potash nitrate were announced recently by the Nitrate Corporation of Chile Limited.

On the industrial list Chilean nitrate of soda, crystal and granulated, 97/98 per cent, for delivery from 1 July to 30 November, 1951, will be sold in lots of six tons or more, delivered carriage paid to any railway station in Great Britain at £29 15s. per ton of 2,240 lbs. gross weight.

Smaller lots delivered carriage paid will be sold at these prices plus the following surcharges per ton: four tons and over (but less than six) 5s.; two tons and over (but less than four) 10s.; one ton and over (but less than two) 20s.; two cwts. and over (but less than one ton) 30s.

An allowance of 10s. per ton will be made to buyers who collect from port warehouses, in which case there will be no surcharges for lots of less than six tons. Nett cash in 30 days from date of delivery.

Agricultural prices for the 1951-52 season for fertilisers for delivery from 1 July to 30 November 1951, will be as follows:—

Six ton lots (or more) delivered carriage paid to any railway station in Great Britain or c.i.f. main ports in the Isle of Man, per ton gross weight. Chilean nitrate of soda, crystal and granulated (15¼/16 per cent N.) £29 15s.; Chilean potash nitrate (about 15 per cent nitrogen and about 10 per cent potash, K_2O) £33 15s.

Additional surcharges for smaller lots will be made per ton, the same as in the industrial list.

Isotope Techniques Conference

PRODUCTS of British atomic energy research are being used for beneficial purposes by countries all over the world, and reports from a number of them will be given at the International Conference on Isotope Techniques which will be opened at Oxford by Sir John Cockcroft, director of the Atomic Energy Research Establishment, Harwell, on Monday next, 16 July.

Delegates from 20 countries are expected to attend, and papers will be given on their advances made in research by the application of radioactive materials from Harwell.

Medical reports will be given by British, Spanish, Danish, Swedish, Dutch, French, German, Finnish, Swiss, Australian and Italian specialists.

A view of the stand of Kestner, Ltd., at the recent British Plastics Exhibition at Olympia. The products shown include a two-ton resin kettle with stainless steel heating coil, a high-speed portable stirrer arranged in a 3 ft. diameter Keebush tank, a PVC tank with a PVC pump, etc.

Widening Range of Chemical Products

Technical Developments Achieved by Coalite

INCREASING demand for its chemical products is recorded in the statement by the chairman of Coalite and Chemical Products, Ltd., in its report for the year ended 31 March, 1951, to be presented at the 34th annual general meeting to be held in London on 18 July.

Return of a sellers' market during the last few months has resulted more in the allocation of certain chemicals, rather than inviting orders.

Isolating New Products

Nevertheless constant attention is given to the isolation of new products and to improving methods of production, and the research department has continued to make notable contributions to the advancement of chemical engineering.

Experience acquired in recent years has placed the company well ahead of potential competitors, either at home or abroad, in the field of liquids and chemicals obtained when coal is carbonised at low temperatures.

It is essential from the point of view of both shareholder and employee that plants should be maintained in all respects in an up-to-date condition.

At the level of prices ruling to-day the cost of replacement of plant and buildings would be at least twice as much as when the assets were originally acquired. To revalue these by reference to replacement rather than historical costs would give a better picture of the financial structure of the company while the corresponding increase in the annual charge for depreciation would retain in the business sufficient funds for the replacement of the assets concerned at to-day's prices.

Unfortunately, this would not affect the calculations of the Inland Revenue Authorities whose method of computing tax takes no account of the cost of replacement of fixed assets.

In this year 1951 there is a great gap between wear and tear allowances for income tax purposes and depreciation calculated on the basis of replacement cost. It seems proper that businesses which are of value to the national economy, should be permitted to set aside out of untaxed profits an amount sufficient to bridge this gap but this is not the case and any sum set aside for this purpose must consequently be taken out of taxed profit.

These allowances have been described as an interest-free loan and a permanent one at that for an industry which demands a continuing programme of development. Now it is seen that the loan is neither permanent nor, in view of the increased standard rate of income tax, free of interest.

The benefit from initial allowances which was received totalled £28,200 and it has been considered prudent to take account of this figure when determining the amount to be transferred to general reserve.

Output was maintained at a high level throughout the year.

A new battery of retorts was completed and put into commission early in January. A further new battery is in course of construction and will be ready to meet the winter demand for 'Coalite'. In the meantime the rebuilding of the older batteries is proceeding according to programme.

During the year the new tar acid fractionation plant was put to work. This has improved the quality and increased the range of the company's chemical products.

One of the problems arising from the carbonisation of coal is the disposal of effluent liquors. The new Rivers (Prevention of Pollution) Bill has directed attention to the disposal of such effluents, particularly in those areas where they cannot be accepted into the local sewage system.

Important Investigations

The Research Department has carried out important investigations into this problem and in co-operation with W. C. Holmes & Co., Ltd., of Huddersfield, plants have been erected at Askern and Bolsover for the recovery of monohydric and dihydric phenols from the effluents with a view to making the latter acceptable to the authorities concerned. Both these plants, together with a central unit at the Bolsover refinery for the further treatment of the phenols so recovered, are now in operation.

At the conclusion of the annual general meeting an extraordinary general meeting will be held to pass a resolution adopting a new set of Articles of Association.

U.K. Tariff Concessions

Concessions Agreed at Torquay

CHANGES in United Kingdom Tariff are to be made on 1 September, 1951, as a consequence of the tariff concessions agreed upon by the United Kingdom during the recent conference at Torquay.

Items among the chemical and allied products on which rates of duty will be altered are given in the schedule below which has been abstracted from the *Board of Trade Journal* of 7 July, 1951.

Current Tariff Classification	Description of Products	Current Rate of Duty	Rate of Duty chargeable on and after September 1, 1951
5	Goods dutiable as falling under the general description 'all synthetic organic chemicals (other than synthetic organic dyestuffs, colours and colouring matters imported for use as such, and organic intermediate products imported for their manufacture), analytical reagents, all other fine chemicals (except sulphate of quinine of vegetable origin) and chemicals manufactured by fermentation processes,' as follows :		
	Amidopyrin	33⅓ per cent	10 per cent
	Cadmium sulphide	33⅓ per cent	20 per cent
	Ethyl esters, the following : ethyl *p*-hydroxy benzoate	33⅓ per cent	25 per cent
	Hexoic acid, the following : α ethylbutyric acid	33⅓ per cent	10 per cent
	Methyl esters, the following : methyl *p*-hydroxy benzoate.	33⅓ per cent	25 per cent
	Phenylguanidine and other substitution derivatives of guanidine and compounds thereof, the following : dicyandiamide.	10 per cent	Free
	Propyl esters, the following : propyl *p*-hydroxy benzoate.	33⅓ per cent	25 per cent
3 XIV (3) (iii)	Calcium carbonate, precipitated	20 per cent	10 per cent
3 XIV (3) (iii)	Carbon blacks (other than from natural gas), except acetylene blacks.	20 per cent	10 per cent
3 G.A.V.	Potassium chlorate	10 per cent	7½ per cent
3 XIV (3) (iii)	Titanium dioxide	20 per cent	15 per cent
3 Exemptions and 3 G.A.V.	Essential oils, natural, but not terpeneless, the following : Vetiver (cuscus). Ylang-ylang.	10 per cent	Free
3 XIV (3) (i)(b)	Paints, painters' enamels, lacquers and varnishes (other than varnishes not containing pigments), but not including pearl essence or paste paints.	20 per cent	17½ per cent
5	Goods dutiable as falling under the general description, 'galvanometers, pyrometers, electroscopes, barometers, analytical and other precision balances, and other scientific instruments.'	33⅓ per cent	25 per cent
5	Goods dutiable as falling under the general description, 'Gauges and measuring instruments of precision of the types used in engineering machine shops and viewing rooms, whether for use in such shops or rooms or not.'	33⅓ per cent	30 per cent
5	Arc-lamp carbons, other than carbons which are externally covered with copper and do not exceed 14 millimetres in diameter.	*Exceeding* 14 *mm. in diameter*, 5s. per lb. *Others*, 7s. 6d. per lb.	2s. 6d. per lb.
5	Amorphous carbon electrodes, but not including primary battery carbons or arc-lamp carbons.	33⅓ per cent	25 per cent
5	Permanent magnets	33⅓ per cent	20 per cent
5	Ignition magnetos	33⅓ per cent	25 per cent

DSIR Open Days

Open Days at the Chemical Research Laboratory of DSIR have been arranged for 1951 and applications from industrial firms wishing to send representatives should be sent, before 31 August, to the Director for the following sessions: 19 September (afternoon), 20 September (morning), 21 September (morning or afternoon).

International Meetings

New Hampton, U.S.A.—16-20 July. Gordon Research Institute: Conference on Ion Exchange.

Stockholm, Sweden.—16-21 July. 13th International Congress on Psychology.

Bedford, England.—16-21 July, College of Aeronautics, Cranfield. Conference on Automatic Control.

Measuring Fluid Flow

New Differential Pressure Device

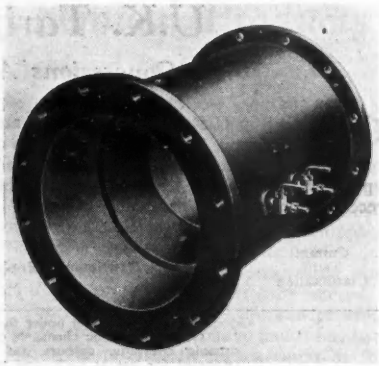
THE commonest method of measuring fluid flow in industry is that which employs a device in the flow main producing a differential pressure, varying with the main flow, which is measured by means of an instrument of manometric type. Three such devices are common today: the long Venturi Tube (also known as the 'Full' or 'Classical' Tube), the short Venturi Tube (or Venturi Orivent), and the Orifice Plate. Another of entirely novel design has just been developed by George Kent, Ltd.

Known as the Dall Tube, it is, for a given differential pressure, smaller and lighter than the Short Venturi; and in differential pressure recovery it is said to be superior even to the Long Venturi.

A meter requiring a certain differential pressure is said to be able to work with a Dall Tube with 30-50 per cent less overall pressure loss than a Long Venturi Tube. Alternatively, if the head loss is specified, the differential pressure generated by the Dall Tube is almost twice or three times that generated by the Long or Short Venturis respectively.

The Dall Tube can also be used as a differential amplifier in combination with a large Venturi Tube (say upwards of 30 in.). A small by-pass carrying the Dall Tube is fitted between upstream and throat tappings on the Venturi. The greatly amplified head generated by the Dall Tube is led to a second measuring instrument (the first being across the main tube), enabling readings to be taken down to about 1/20th or 1/30th of the maximum flow in the Venturi.

Made of cast iron or steel, with a liner of brass or gunmetal, the Dall Tube consists of a short length of 'lead in' parallel pipe followed by two cones spaced apart at the throat, allowing a small gap. The larger end of both cones is appreciably smaller than the pipe bore. Both the cones are short and for the smaller sizes fully machined. Above about 24-in. pipe diameter only the centre portion of each cone is machined. Upstream pressure is taken out just before the larger end of the approach cone, while the throat tapping is within the chamber formed by the cone walls, in line with the gap between them.



The Kent Dall Tube

Next Week's Events

TUESDAY 17 JULY

Institution of Chemical Engineers

London: Royal Institution, Albemarle Street, W.1. Conference on Mixing and Agitation in Liquid Media. 10.0 a.m. 'Recent Developments in the Theory and Practice of Agitating and Mixing,' by D. M. Newitt, G. C. Shipp and C. R. Black; 'Mixing of Coals with Liquids,' by R. A. Taylor; 'Practical Aspects of Liquid, Mixing and Agitation,' by B. N. Reavell. 2.0 p.m. 'Liquid-liquid Mixing as Affected by Internal Circulation within Droplets,' by F. H. Garner and A. H. P. Skelland; 'The Action of Free Jets in the Mixing of Fluids,' by H. Fossett; 'Some Factors Affecting Mixing Processes in the Ceramic Industry,' by A. E. Dodd and F. J. Goodson.

WEDNESDAY 18 JULY

Faraday Society

Leamington Spa: General discussion: 'The Size and Shape Factor in Colloidal Systems.' (Until 20 July).

FRIDAY 20 JULY

Royal Institute of Chemistry

London: Institute of Electrical Engineers, Savoy Place, W.C.2, 6.30 p.m. Second P. F. Frankland Memorial Lecture. Dr. R. L. M. Synge, F.R.S.: 'Biological Aspects of Protein in the Light of Recent Chemical Study.'

SATURDAY 21 JULY

Biochemical Society

Sheffield: The University, Department of Biochemistry, 10.30 a.m. Reading of papers.

Non-Ferrous Metals

Fair Distribution of Materials Essential

CONFIDENCE in the technical skill and commercial ability of the non-ferrous metals industry to overcome the present abnormal conditions was expressed by Mr. W. H. Henman, retiring president of the British Non-Ferrous Metals Federation, in his general survey of the year at its sixth annual general meeting held in Birmingham on 5 July.

Shortage of raw materials continued to be the main problem. Demand had greatly exceeded the capacity to supply. This was, however, to some extent an artificial state of affairs brought about partly by the building up of reserve stocks by the U.S.A. and other nations, including our own.

Stockpiling, although it withdrew part of the annual production and reduced the actual quantity available for normal use did not, of course, consume the metal which remained in case of need.

Additional difficulties were caused by an accelerated defence programme with its increased requirements which had to be met out of a diminished supply of raw materials.

The grave concern of the federation lay in the continued shortage of virgin metal, and the consequent drying up of scrap, the metals most seriously affected being nickel, zinc and copper.

Government Responsible

Under the present system of bulk purchasing and international co-operation, the prime responsibility for dealing with such shortages lies with H.M. Government. When the formation of a Ministry of Materials was projected the advice of the federation was sought as to whether it should act as a sponsoring ministry for the wrought non-ferrous metals industry.

After careful consideration the recommendation of the federation was accepted and it was decided that the procuring of copper, zinc, nickel and other metals should be the responsibility of the new Ministry, but the wrought industry should remain with the Ministry of Supply.

Raw materials had also been the subject of discussion on an international level both by the International Materials Conference and the OEEC. The federation had been fortunate in having an industrial adviser to represent it in Washington in the person of Mr. R. Lewis Stubbs, of the Zinc Development Association.

While a free market all over the world for non-ferrous metals was naturally to be desired, nevertheless so long as the present difficulties continued, the federation welcomed international action which would secure fair distribution and would ensure that no one was starved of metal for essential purposes.

Washington Considers Prices

The question of prices was being considered in Washington and this was essential, as it was quite clear that any system of allocation must break down unless the quantities distributed were available to all at a uniform price, which should preferably be as low as possible.

A system of manufacturing priorities had been in force for some time, but the recently introduced scheme of Defence Orders and Preferential Treatment was welcomed.

Productivity still remained one of the most pressing problems. The report of the productivity team, which under the leadership of Mr. W. F. Brazener had visited the U.S.A., was now being carefully studied. It was too early to assess the full results but any lessons learnt would be carefully studied and vigorously applied.

Steel Output Maintained

STEEL output in June, despite the ever increasing difficulties of raw material shortages, reached the annual rate of 16.007 million tons, compared with 15.864 million tons in the previous month, and 16.249 million tons in June, 1950, according to the figures issued by the British Iron and Steel Federation.

Production for the first six months of this year has been at an annual rate of 16.306 million tons, which was only 303,000 tons below the level reached at the end of the first half of 1950.

Pig-iron production is still on the increase. Output in June was at an annual rate of 9,497,000 tons, an increase of 23,000 tons over the same month of last year, and 15,000 tons more than May, 1951. For the first half of this year production was at an annual rate of 9.506 million tons, compared with 9.611 million tons in the same period of 1950.

SCI Annual Meeting

Mr. John Rogers Elected President

AT the 70th annual meeting of the Society of Chemical Industry which was held at the Royal College of Science, London, on Tuesday morning, Mr. John Rogers, chairman of Imperial Chemical Industries, Ltd., was unanimously elected president in succession to Mr. Stanley Robson. Mr. Julian Leonard was re-elected hon. treasurer, Dr. L. H. Lampitt was re-elected hon. foreign secretary, Mr. F. P. Dunn, hon. publications secretary, and Dr. E. B. Hughes, hon. secretary.

A most scholarly (but at the same time practical) presidential address was given by Mr. Robson on the subject of the sulphur shortage and sulphur sources. Although Mr. Robson referred to his address as 'a short, simple account of an ordinary chemical matter' it was far more than that and undoubtedly members are looking forward to its ultimate publication.

While Mr. Robson had no specific suggestions to make and did not attempt to outline any single method by which the sulphur shortage could be immediately overcome he did urge mining as well as chemical companies to endeavour to recover as much sulphur as they could. He described how some companies in Canada and elsewhere were doing this.

In conclusion he said that the problem was likely to maintain the same lively interest that it had attracted ever since the King of Sicily had interfered more than 100 years ago. He was sure that the final chapter on sulphur had not yet been closed.

Refinery Output Trebled

THE second distillation unit at the Stanlow (Cheshire) oil refinery is now in operation, nearly a month ahead of schedule. This trebles the plant's capacity, bringing it to over 3 million tons a year.

The refinery, which first came on stream in November 1949, is due for completion in January 1952. In addition to producing a comprehensive range of petroleum products, including high quality petrol, gas oil, fuel oil, synthetic detergents and chemical solvents, it will also make full use of its refinery gases as raw materials for its own large chemicals-from-petroleum industry. Five further units are yet to be completed, including a 'catcracker,' on which work is well advanced.

Raw Materials

IMC Allocations Announced

MOLYBDENUM and tungsten are to be distributed under an allocation scheme which is being introduced immediately by the International Materials Conference, it was announced in Washington on 7 July.

At the same time allocations of both metals for the third quarter of the year were announced. Tungsten available amounts to 2,800 tons, which will be distributed as follows: U.S.A. 1,255 tons, Britain 695, France 280, Germany 290, Sweden 210, Canada 26, Yugoslavia 16, Australia 15, and Spain 13.

Of the 4,400 tons of molybdenum available the U.S.A. will receive 3,420 tons, Britain 515, France 195, Germany 125, and Sweden 100. An additional 45 tons is available as reserve to other countries which have not yet filed requirements. These allocations, it is stated, are not necessarily to be regarded as setting up a permanent pattern for the future.

Many problems in relation to the distribution, shortage, and prices of other important raw materials still remain to be considered by the International Raw Materials Conference.

Most immediate of these are attempts to link pricing agreements and to recommend tonnage allocations, and the demand of raw-materials-producing countries for guarantees on obtaining finished products. If raw material prices are to be controlled, it is natural that the countries producing them should desire stabilisation of prices of the goods which they have to buy.

The present position of some of the IMC committees may be summarised as follows:

Sulphur.—Proposed world allocation for the third quarter was 252-253,000 tons. U.S.A. is willing to allocate 250,000 tons.

Copper, Zinc and Lead.—It was generally agreed no action need be taken at present on lead. It is hoped to recommend allocations for the other two metals for the fourth quarter. Price agreement is one of the main problems.

Cobalt, Nickel and Manganese.—Agreement has nearly been reached on allocation of cobalt and nickel for the fourth quarter. Collection of statistics has delayed matter in regard to manganese, but arrangements should be completed in time to make allocations for the fourth quarter.

The Chemist's Bookshelf

TECHNICAL PUBLICATIONS 1948. Edited by A. E. Becker. Standard Oil Company, New Jersey. 1950. Pp. 512.

This book contains a collection of papers which have been published by members of the staff of the Standard Oil Company (New Jersey) during the year of 1948. Similar anthologies have appeared for the years of 1946 and 1947 and the foreword states that interest in the earlier volumes has led to the publication of the present collection.

As all the material included has been published before in one form or another, this type of book must be considered as a form of abstract journal, in which the selection of papers is made not upon their subject or author, but upon their point of origin or sponsor. If this form of publication is continued and adopted by a large number of other companies, an unlikely contingency because of the cost involved, it would be possible for future students to trace the research activity of an industry over many years, to analyse it and to see the growth of ideas and techniques. It might also be possible for research directors of the future to study the success or failure of past programmes and gather information upon the organisation of research.

On the other hand the publication of books of this type adds a further heading under which to search for information. The unfortunate literature searcher must look under the heading of the company, in addition to that of author and subject. It is important to stress at this point that the present volume contains only a selection of papers published by the staff of the Standarl Oil Company, some 21 papers having been chosen out of a total of over a 100 appearing in print during the year.

As might be anticipated there is a very wide range of subject-matter and only 10 or so papers will be of general interest to the chemist. Chemical engineers will be interested in the paper on the production of xylidines by high pressure hydrogenation—a very complete description of a pilot plant process which appeared in *The Industrial and Engineering Chemist* for August, 1948.

The section dealing with rubber and plastics contains several interesting articles. First among these is the 'Vulcanisation of butyl rubber by *p*-quinone dioxime and its derivatives' by J. P. Haworth. This contains an account of a detailed investigation of the early discovery by Ostromisslenski that rubber could be vulcanised with aromatic polynitro compounds, in addition to the more usual sulphur-containing compounds. Other papers in this section are concerned with the reaction of Buna rubber with aliphatic mercaptans and the relation between polymeric unsaturation and the relative rate of cross linkage.

The analytical section contains two papers upon the use of infra-red spectra. There is also an interesting method of determining sulphites, thiosulphates and sulphides in refinery spent caustic solutions.

At the end of the book there are short biographies of the authors and a list of other papers published in 1948 and not included in the present book.—J.R.M.

INDUSTRIAL SOLVENTS. By I. Mellan. Second Edition. Reinhold Publishing Corporation, New York. Chapman & Hall, London. 1950. Pp. 758. 96s.

The author of this book is an industrial chemist and consultant in New York and the first edition originally appeared in 1939. In the intervening eleven years much progress has been made both in the manufacture of solvents and in the development of new applications for them. The scheme of the first edition has been adhered to in principle but the scope of this new edition has been widened to cover the more recent advances in the solvent field.

For those not familiar with the earlier edition it may be stated that the present volume comprises 16 chapters of which the last ten deal with the various types of solvents grouped according to their chemical classification; hydrocarbons, alcohols, etc.

The opening chapters relate to the more theoretical aspects of solvents and solutions and in the first two chapters the nature of solution and types of solvents are discussed. Among other topics covered in these chapters are dilution ratio, compatibility, blushing and plasticisers, although it should be mentioned that the amount of space devoted to the last subject is only superficial since the author considers that it merits a volume of its own.

Chapters three and four are concerned with some physical properties of solvents such as evaporation rate, boiling point and viscosity. Considerable attention is paid to constant boiling mixtures and many of the more common azeotropes are tabulated with their boiling points and percentage compositions. These chapters contain a wealth of tabular data and also many graphs from which it is easy to read off comparative values for many solvents. The next chapter, devoted to the industrial application of solvents, is 80 pages in length and gives an excellent cross section of the many varied uses to which organic solvents are now put. Apart from their obvious uses such as thinners, resin solvents and for vegetable oil extraction, mention is also made of some of the more modern developments in petroleum refining, hydraulic brake fluids, dry cleaning and insecticides.

An entirely new chapter has been added on the safe handling of solvents. Much useful information is listed here on flash points, explosive ranges and toxicities of the more common solvents and in many cases the maximum allowable concentrations are noted. The authorities quoted for this last information are usually American and therefore the values given may not necessarily agree with those laid down by the Home Office, but nevertheless they provide a useful guide. Particular attention is paid to the hazards of handling carbon disulphide in this chapter.

In the second part of the book are listed all the common solvents, classified according to chemical type. The best idea of the wide coverage given is to list in order the various chapter headings: hydrocarbons, halogenated hydrocarbons, nitroparaffins, amines, alcohols, furfural, ketones, acids, ethers and esters. A similar lay-out is followed in each chapter and under the heading of the individual solvent is stated the appearance, method of manufacture and uses. For most of the solvents this is followed by a table of typical properties and specifications. For common solvents there are also tables and graphs showing the change in density with temperature, varying solubility in water, etc. For those solvents which might almost be classed as heavy chemicals statistics are given for production and allocation to various industries. These figures relate to the U.S.A. only and are usually for the period around 1945. References are given at the end of each chapter and also a selected bibliography, with the literature reviewed up to 1949, at the end of the book.

In all over 380 solvents are described and the volume contains a wealth of material which is of paramount importance to chemists and chemical engineers in many fields including synthetic plastics, paints and varnishes. The volume is well produced and free from serious misprints and may be confidently recommended as a very worthwhile addition to the chemist's bookshelf.—G.G.S.D.

INORGANIC QUALITATIVE ANALYSIS: A CONCISE SCHEME. H. Holness. London: Pitman & Sons. 1951. 1s. 9d.

This is not a book, but a sheet of cardboard folded in four, reinforced with cloth, and varnished for protection during continual use at the bench.

It carries on the inside notes on the preparation of a test solution, seven preliminary tests, and the scheme for the normal group separation of the common cations in tabular form. On the reverse side there are five tests for acid radicles and a procedure for the removal of phosphate.

The only deviations from normal procedures are the method for the separation of the acid insoluble sulphides by lithium hydroxide and a variant of the zirconium-phosphate separation, both of which were devised by the author.

While it is clear that a card such as this must be supplemented, away from the bench, by the use of a standard text-book, elementary students of qualitative analysis will undoubtedly find it of value, as long as it is impressed on them that it *is* a concise scheme, and not the whole of qualitative analysis. They must not, in other words, be allowed to regard it as a substitute for a text-book, but merely as a means of saving the text-book from too much exposure to bench hazards.—C.L.W.

Recent Trends in Fuel Research

Varied Tests in Greater Efficiency

MODERN developments to improve the efficiency of coal utilisation were described by Dr. A. C. Monkhouse, deputy director of the Fuel Research Station, DSIR, in a lecture given to a joint meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry and the Luton Scientific Association, at Luton on 5 April.

Considerable attention has been paid to the burning of coal in boilers and furnaces where the consumption of coal, excluding power station boilers, amounts to about 80 million tons per year. Of this amount, 40-50 million tons are used in shell boilers of the Lancashire type, many of which are hand-fired and are particularly prone to smoke emission.

By the admission of controlled secondary air through the furnace front, using special doors devised at the Fuel Research Station, it has been found possible, not only to reduce smoke, but also to increase the efficiency of the boiler.

A source of inefficiency in large power station boilers is the formation of deposits on the generator, superheater and economiser tubes which lower the transfer of heat and reduce the gas space between the tubes. In the cooler parts of the boiler system, acidic deposits corrode the plates or tubes.

These deposits are derived from the inorganic part of the coal (fused ash, a matrix of sulphates or acid sulphates in which are embedded particles of fly ash, or a similar matrix of phosphates). When burning the same coal, there are less deposits in pulverised fuel boilers than in mechanical stokers.

Gas Turbine Possibilities

Use of the 'Grid', 'Multijet', and 'Vortex' burners were described, in which coal particles and air are brought into intimate contact, and a high heat release per unit of combustion space obtained. Work is in progress on the combustion of pulverised coal for use in the gas turbine. It is possible that the gas turbine will compete with the steam turbine in certain cases; in the U.S.A., a coal-fired gas turbine locomotive is being developed.

More efficient utilisation of small and low grade fuel is required. Trials are being carried out on gasification schemes both in air and steam and in oxygen and steam and including the use of a fluidised bed. The velocity of gas required for fluidisation is independent of its density and inversely proportional to its absolute viscosity.

Gasification technique has been applied to coal *in situ* underground. Problems include control of gasification, avoidance of by-passing of air and satisfactory utilisation of the produced low-calorific-value gas.

Improving Yield

Methods of hydrogenation and hydrocarbon synthesis by the Fischer-Tropsch process were illustrated. Some five tons of coal are required per ton of liquid products obtained. Improved methods of gasification could improve this yield. An estimate has been made that in Great Britain, using coke at £3 per ton as the source of synthesis gas, the cost of production of oil by the Fischer-Tropsch process would be 2s. to 2s. 6d. per gallon.

In domestic heating, the trend has been to the development of appliances to provide at least twice the heat from the same amount of coal used in the pre-war appliance. This has involved the development of methods for the measurement of radiation, convection and water heating.

At the Fuel Research Station, a building has been erected containing four calorimeter rooms, each 12 ft. sq. by 9 ft. high, placed centrally in a constant temperature chamber. The walls, floor, and ceiling are of plywood, covered inside and out with copper sheets, in which are embedded thermocouples; air flow and temperatures are automatically recorded. The smoke content of the chimney gases is measured photo-electrically.

Changes of Name

M. L. ALKAN (SALES), LTD., to M. L. ALKAN, LTD.

NEON LUMINATIONS, LTD., to GLASS CONTAINERS (MEDICAL), LTD.

HOME

The Worker in Industry

Latest ideas and records of practice on the more important aspects of manpower will be the subject of a series of lectures under the title of 'The Worker in Industry,' to be given at the Safety, Health and Welfare Museum, Horseferry Road, London, in connection with the Festival of Britain. 'Technical and Scientific Manpower' will be discussed by Lord Hankey, chairman of the Technical Research Committee in a lecture on 29 August.

Dunlop Extension Schemes

Two developments for increasing the output of tyre fabric are announced by Dunlop. In two years' time it is hoped to begin production of rayon tyre cord in the new building about to be put up near Londonderry by the Government of Northern Ireland. The plant will be mainly new, but some machinery is to be transferred to Londonderry from the main mill at Rochdale. In Dunfermline, the Victoria mill is being extended for the increased production of rayon tyre fabric and of cotton fabric for colliery conveyor belting.

Technical and Scientific Register

The total number of persons enrolled on the Technical and Scientific Register on 21 May, 1951, was 5,234. This figure included 3,697 registrants who were already in work but desired a change of employment, 538 students provisionally registered, and 999 registrants who were unemployed. During the five weeks 17 April to 21 May, 700 vacancies were notified, 209 were filled, and 430 were cancelled or withdrawn.

Fatal Industrial Accidents

The number of workpeople in the United Kingdom whose deaths from accidents in the course of their employment were reported in May was 204, compared with revised figures of 125 for the previous month, and 102 in May, 1950. Only four deaths were reported in the chemicals, oils, soaps, etc. Metal conversion and founding accounted for eight, metal extracting and refining, one, and there were three in the clay, stone, cement, pottery and glass factories.

Chemical Society Library

Summer arrangements for its library have been announced by the Chemical Society. From 16 July to 30 September the library will be open daily from 10 a.m. to 5 p.m., except during the fortnight 6-18 August inclusive, when it will be entirely closed for revision and cleaning.

Imperial Smelting Corporation

Due to an unfortunate error in our issue of 7 July (page 11), the Imperial Smelting Company was stated to supply 3 per cent of the country's zinc requirements. The figure should of course have read 33 per cent, or roughly one-third of the requirements.

Pensioners Outing

Viscount Leverhulme (Lord-Lieutenant of Cheshire) and Lady Leverhulme with the Mayors and Mayoresses of Birkenhead, Wallasey and Bebington, accompanied nearly 700 men and women pensioners of Lever Bros. (Port Sunlight), Ltd., and other Unilever companies on a river cruise on the River Mersey on 2 July in connection with this year's centenary celebrations of the birth of the first Lord Leverhulme, founder of the firm. The pensioners included two who had given 52 years' service and thirty who had completed 50 years. By the end of July ten similar cruises for employees will have been held making a total of 6,500 guests.

Chemical Factory Explosion

One man was killed and three were detained in hospital with severe burns as the result of an explosion at a chemical factory at Oldbury, Worcestershire, on 10 July. The explosion occurred in a drying oven which contained a sodium chemical and a fire which resulted was soon under control. The factory was being used for experimental work in production of chemicals for insecticides. Albright and Wilson stated that this was the first incident of the kind to occur in this operation and an inquiry would be held.

Balloon Explosion

Six men were slightly injured on 10 July when a 30 ft. cosmic radiation balloon exploded during a Festival of Britain demonstration at the Wills Physics Laboratory, Bristol.

• OVERSEAS •

Low Gravity U.S. Battery

In reducing the specific gravity of the sulphuric acid they use in their batteries, Socony-Vacuum, Inc., say that they have achieved a considerable saving both of acid and lead, while decreasing the capacity of the batteries only slightly. The full charge specific gravity of the new '210' battery is 1.26 instead of the usual 1.28-1.30, but it is said to last 14 per cent longer than the conventional type.

New Non-Nickel Plating

A method of plating metals without nickel and yet giving them as bright a finish and as much corrosion-resistance as the old nickel plating has been developed by the Westinghouse Electric Corporation of America. The technique, called periodic reverse plating can be applied easily to all metal parts, and allows the incorporation of some nickel where the regulations allow it—*i.e.* in the plating of car bumpers. The key feature of the process is an electrical 'back-stroke' that deposits and then removes metal alternately, producing a bright chrome-on-copper surface. Many hundreds of thousands of gallons of copper-plating solution are already available for use.

Cuprammonium Rayon

Discovery of a dyeing process that can be used on viscose rayon solution before spinning, thus avoiding distortion of the fibre by subsequent dyeing, has led the Farben-Fabriken Bayer company in Dusseldorf to increase their exports of the fibre to America and Canada by large amounts. Contracts in Canada and the U.S. for the first half of this year amounted to $2,300,000, and would have been more had the German firm not been selling only in exchange for raw materials — namely, cellulose. Canadian firms are now making carpets, rugs, as well as suitings and knitted goods, from the fibre, which has a springier, more wool-like feel, they say.

Israel's Mineral Resources

Possible development of the mineral resources of Israel are being studied by an expert of the U.S. Bureau of Mines, who recently arrived in the country. Projects include research on bituminous limestone and establishment of an ore dressing laboratory.

Sulphur Search in Canada

Acquisition of a controlling interest in Sunbeam Sulphur, Limited, of Calgary, through negotiations with Fortune Oils, Limited, is announced by Dominion Tar and Chemical Co., Ltd. The two companies will commence exploratory drilling immediately. Two showings of sulphur have already been located in an area about 100 miles north of Edmonton, and while it is too early to evaluate the extent of these deposits, there are indications of sizeable mineral bodies.

Sulphuric Acid Plant for Ecuador

A 30-year agreement has recently been signed at the Tixan Mines between the Ecuadorian Junta de Asistencia Publica and the Chemical Plants Corporation which is to begin installation at once of a plant for sulphuric acid manufacture. At a later date the corporation also intends to establish plants for the manufacture of caustic soda and rayon.

Acetylene's New Blood

The synthesis of polyvinylpyrrolidone—the new blood plasma substitute—from acetylene by the General Aniline & Film Corporation of America (outlined in *Chemical Engineering*), is one example of the great growth of acetylene chemistry in the last decade. Starting from calcium carbide and water, the corporation react formaldehyde with the acetylene produced, in a pressure ethynylation reactor over a copper acetylide catalyst to give butynediol. The products are then fed to a separator where the unreacted acetylene is recycled, and the formaldehyde is removed in a stripping still. The butynediol solution is then hydrogenated over a Ni/Cu catalyst to give butanediol, which is cyclised to butyrolactone by dehydrogenation. Amination converts this compound into pyrrolidone, which is vinylated in the presence of an alkaline catalyst. The resultant vinyl pyrrolidone is kept pure by distillation in a stainless steel vacuum tower and is stored in glass-lined tanks. It is next polymerised in a stainless steel kettle, and the polymer is diluted with pyrogen-free distilled water and pumped to a spray dryer. The fine white powder is prepared as an isotonic solution buffered to approximately *p*H 7.

· PERSONAL ·

MR. G. B. JONES, Mayor of Huddersfield, retired last week-end as general works manager of I.C.I., Ltd., Huddersfield. His successor is DR. C. R. MAVIN, assistant works manager. Dr. Mavin is a native of Northumbria and graduated in science at Durham University. He joined I.C.I. in 1938 as a research chemist and was assistant works manager at the Blackley factory, Manchester, before going to Huddersfield in 1947.

The British Non-Ferrous Metals Federation announce the following officers to have been appointed for the year 1951-52: *President and chairman of the executive committee*: MR. W. J. TERRY; *past-presidents*: MR. HORACE W. CLARKE and MR. WILLIAM H. HENMAN; *vice-presidents*: MR. H. E. JACKSON, MR. H. GIBBINS, and MR. W. F. BRAZENER; *treasurer*, MR. A. L. JOHNSON.

MR. LYMAN HALL ALLEN, Jr., formerly with Foster D. Snell, Inc., has been appointed division engineer of the viscose section of the central engineering department of Celanese Corporation of America.

The International Nickel Company of Canada Limited announce the election to the Board of THE HONOURABLE LEWIS W. DOUGLAS, former American ambassador to the Court of St. James, and MR. I. C. RAYMOND ATKIN, vice-president, director and member of the executive committee of J. P. Morgan & Co. Inc.

Born in Arizona of Canadian ancestry, Mr. Douglas was at one time a member of the Arizona House of Representatives and subsequently of the United States Congress. Mr. Douglas had been engaged in mining and general business in Arizona. Later he became vice-president and a member of the board of directors of the American Cyanamid Company and principal and vice-chancellor of McGill University, Montreal.

Mr. I. C. Raymond Atkin was born in Ontario, Canada, and saw distinguished service in the Canadian Army in World War I. A former president of the Canadian Society of New York, he was with the Royal Bank of Canada prior to joining J. P. Morgan & Co. in 1925. He became a partner in the firm in 1939 and vice-president on its incorporation in 1940. A director of Canada Life Assurance Company and Johns Manville Corporation, Mr. Atkin is also chairman of the Foreign Exchange Committee of the New York Money Market.

Laporte Chemicals, Ltd., announce that MR. HERBERT À BRASSARD has been appointed as technical consultant with particular reference to the textile and allied industries.

Nichols Chemical Co., Ltd., Montreal, announce the appointment of DR. EDWARD P. AIKMAN as general manager. A graduate of McGill University, Dr. Aikman has been associated for the past 16 years with the General Chemical Division, Allied Chemical & Dye Corporation, of New York City, an affiliate of Nichols in the U.S.A.

Obituary

One of Canada's foremost chemical-metallurgical engineers, W. E. PATTERSON, 51, died suddenly in Edmonton on 26 June while on a business trip to Alberta. Manager of technical development for Merck & Co., Ltd., Mr. Patterson was responsible for building the first penicillin plant in Canada using the submerged fermentation technique, and was actively associated with the construction and initial operation of a streptomycin plant which is the only one of its kind in this country. Born in January, 1900, Mr. Patterson was a graduate of Queen's University, Kingston, Ont., in chemical and metallurgical engineering and for 20 years was employed by G. J. Sterne & Son, Brentford, Ont. In the early years of the last war he was associated with Allied War Supplies Corporation. He joined Merck & Co. in 1942. Mr. Patterson was a Fellow of the Chemical Institute of Canada; member of the American Institute of Chemical Engineers, the Engineering Institute of Canada, and the American Chemical Society.

The Morgan Crucible Co., Ltd., announce with regret the sudden death on 27 June of MR. H. C. MILLS, managing director.

Publications & Announcements

LABOUR relations in the steel industry are reviewed in the *Monthly Statistical Bulletin* (Volume 26, No. 5) issued by the British Iron and Steel Federation. Methods of payment, average earnings and working conditions in blast furnaces, melting shops and rolling mills are described.

* * *

A NUMBER of theses for the degree of Doctor of Philosophy have recently been received from the University of Illinois. An interesting subject which may throw light on the structural principles causing the insecticidal action of nicotine polypyridines, and related substances was chosen for research by E. F. Reiner, who synthesised successfully a range of 2,3'- and 2,2'-linked polypyridines for comparison with nicotine. T. J. Swoboda carried out research on the functional rôle of each ingredient in the 'Redox' systems introduced into low temperature synthetic polymerisation reactions with the object of improving the product by speeding up the reaction. He also worked on the interaction between insoluble polymeric electrolytes such as wool or 'Nylon' fibres and aqueous solutions of acids or bases. By graphs based on titration equations he estimated the equilibrium coefficients of the acidic and basic absorption reactions and the number of carboxyl and amino groups present per gram of fibre, using radio-sodium much of the time to estimate the small amounts of base absorbed.

* * *

HOW a 25-year old refinery at El Dorado, Kansas, was modernised and expanded without halting production is described and illustrated by flow diagrams and pictures in 'Kelloggram', No. 1, 1951, just issued by the M. W. Kellogg Company, refinery and chemical engineers of New York City. This major task was carried out by Kellogg and Skelly Oil Company engineers in two phases. First, the addition of new processing facilities consisting of crude distillation and fluid catalytic cracking. Second, the revamping of several process units including two thermal crackers, the vacuum flashing system, the vapour recovery system, and the catalytic polymerisation plant.

* * *

WELCOME souvenir of the 70th anniversary annual meeting of the Society of Chemical Industry held in London this week was the special number of *Chemistry & Industry* (No. 26), which besides giving the programme and abstracts of papers, contained a delightful editorial on 'The Real London', and articles on 'London's River'; The Wallace Collection; The Victoria and Albert Museum; the Royal Mews; and the Royal Mint. This issue will indeed be valued not only by those fortunate enough to attend the meetings but also by those who have been unable personally to participate in many interesting events arranged by the SCI.

* * *

APPEARING appropriately enough during the run of the first British Instrument Industries Exhibition, the first volume of A. Gallenkamp & Co., Ltd.'s 12th edition catalogue of laboratory equipment and scientific apparatus is a handsome tome of over 800 pages packed with useful information, which supersedes the general section circulated in 1939. It was decided not to publish a new general catalogue immediately after the war as owing to scientific development much of the apparatus included in that catalogue needed review and redesign. In addition it was realised that the British Standards Institution, the British Laboratory Ware Association and other bodies representative of users and manufacturers, were engaged in revising specifications and rationalising sizes of apparatus.

Much of this work of redesign, revision and rationalisation has now been completed and the results are embodied in the new catalogue. The general arrangement, alphabetical order, and so on of the previous volume were found so satisfactory, however, that little alteration in layout has been necessary. The present edition is divided into eight sections and index as follows:—Introduction, general information; laboratory fittings; general laboratory apparatus (A to Z); standard joint glassware; microchemical apparatus (A to Z); electrical apparatus, instruments, and sundries; equipment for radioisotope applications; laboratory chemicals and reagents.

Revision of the Industrial and Pathological sections of the 11th edition catalogue are in progress and publication of these as Volumes II and III of the 12th edition will follow in due course.

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Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

PULSOMETER ENGINEERING CO., LTD., London, S.W. (M., 14/7/51). 7 May, debenture, to Lloyds Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. 6 June, 1950.

WEST NORFOLK FARMERS MANURE & CHEMICAL CO-OPERATIVE CO., LTD., Kings Lynn. (M., 14/7/51.) 3 May, agreement supplemental to and varying the original debenture dated 6 September, 1946, securing £300,000, to Co-operative Wholesale Society; general charge. *Nil. 5 January, 1951.

Satisfactions

BAKELITE, LTD., London, S.W. (M.S., 14/7/51). Satisfaction 8 May, of charge registered 14 June, 1933.

BRITISH PLASTOIDS CO., LTD., Nottingham, manufacturers of plastics, etc. (M.S., 14/7/51). Satisfaction 4 May, of charge registered 8 August, 1947, further charges registered 24 October, 1947, 24 September, 1948, and 19 September, 1949, and a debenture registered 19 September, 1949.

NATHAN BROWN PROPRIETORIES, LTD., Stockport,, chemists, etc. (M.S., 14/7/51). Satisfaction, 4 May, of charge registered 19 October, 1949.

New Registrations

Northern Supply Services, Ltd.

Private company. (N.I. 2992). Capital £1,000. To carry on the business of manufacturers of and dealers in certain medical preparations, etc. Subscribers are: Thomas B. Girvan, solicitor's apprentice, and Margaret M. Hamilton, typist, both of 7 Donegal Square West, Belfast.

International Paints Ltd.

Private company. (497,150). Capital £1,150,000. Objects: To acquire the paint manufacture undertaking and certain of the assets of International Paints (Holdings), Ltd., etc. The subscribers and other particulars are similar to those of International Paints Export, Ltd. (q.v.).

Wynstay Manufacturing Co., Ltd.

Private company. (497,120). Capital £100. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in perfumes, scents, dyes, cosmetics, etc. Directors: L. K. Wynschenk, 20 Vicarage Road, Edgbaston, Birmingham, and E. Taylor, 'Hazelcroft', Lindum Avenue, Trentham, Stoke-on-Trent. Secretary: Noreen E. B. Wynschenk. Solicitors: Westwood Morris & Co., Birmingham. Reg. office: 110 Dale End, Birmingham, 4.

Market Reports

LONDON.—Demand for industrial chemicals during the past week continued at a high level both for home account and for shipment, with spot or near delivery business difficult to place. Deliveries against contracts are being fairly well maintained but the overall supply position is not easier. The soda products almost without exception are in strong request and offers of sodium bichromate are being keenly sought for shipment. Increased prices for sodium nitrate have been announced and the general price position continues firm. Supplies of coal tar products are short of the actual demand and the tone in this section is strong with A.D.F. cresylic acid maintaining a high price level.

MANCHESTER.—The market for heavy chemical products has continued firm in virtually all sections. Solid and liquid caustic soda and other alkalis have met with a brisk demand for contract deliveries and plenty of fresh inquiries for these and for other essential lines from home users have been in the market. Export demands were also steady. In the fertiliser market sales are at a seasonably low level and it is not yet possible to say what the effect will be of the sharply increased prices. A brisk demand for all descriptions of tar products was reported.

GLASGOW.—There has been considerable activity in the Scottish heavy chemical market with the usual reactions of shortage of supplies of many of the generally known chemicals. The packaging difficulty is again apparent. The export market has been fairly brisk.

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Totally encl. **MIXER,** approx. 6 ft. int. diam. by 6 ft. deep on straight, 3 ft. hemispherical bottom. Domed cover. 6 in., 4 in., 3 in., 2 in. and 1¼ in., connections to cover, with 18 in. diam. hinged manway. Three 2 in. connections in side, and 5 in. and 3 in. bottom outlets. F. and L. pulley drive.

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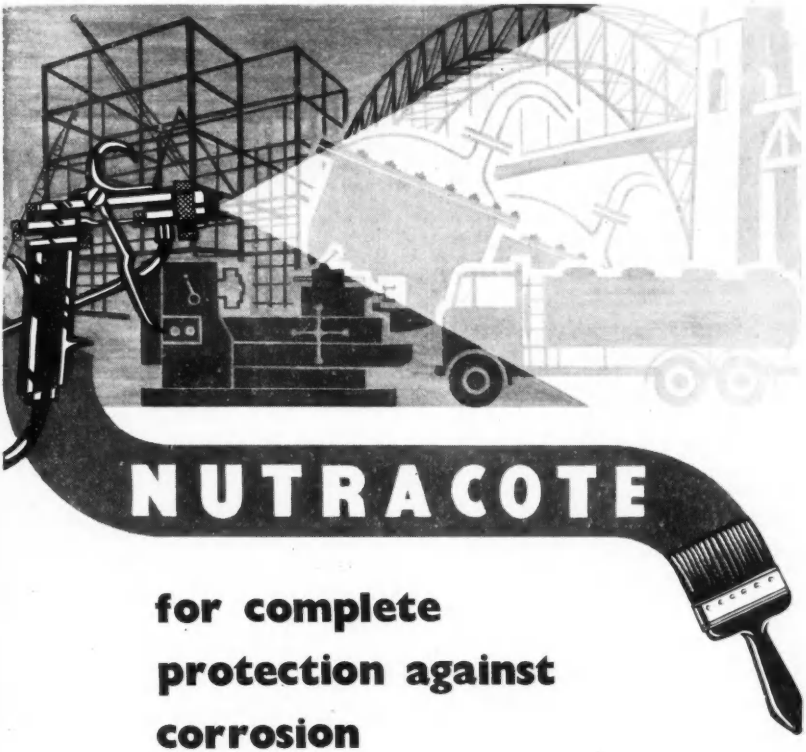

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